TORRENT SYSTEMS, INC. (formerly Applied Parellel Technologies, Inc.)

A User-Friendly Programmer's Tool for Writing Parallel-Processing Software

Massively parallel machines with hundreds or thousands of individual processors — hold great promise for solving many formerly intractable computing problems in government and industry. Estimates suggest that parallel processing would save the U.S. airline industry alone more than $1 billion annually through more efficient scheduling of flight crews. It could enable U.S. oil companies to reduce exploration costs and increase oil reserves. Analysis of massive transaction databases using parallel processing could recover much of the tens of billions of dollars lost annually to health care and credit card fraud.

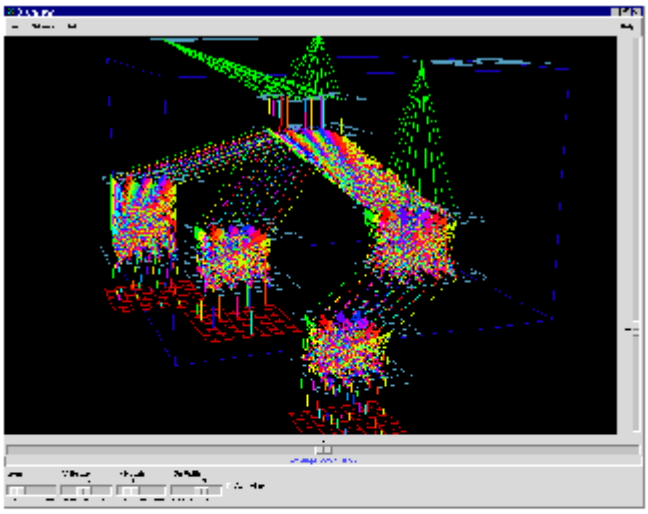
COMPOSITE PERFORMANCE SCORE
(based on a four star rating)
* * * *

Easy-to-Do Programming for Parallel Processing

A difficulty with parallel processing, however, is that writing its software is more art than science, an art practiced well by a relatively small number of programmers. Torrent Systems, founded as a two-person company in 1993, had an idea for solving this problem but was unable to find venture capital to finance the research to develop the technology. The company then sought and won ATP funding that enabled it to proceed. Torrent ultimately developed a component software system that allows programmers to build parallel-processing software systems without needing to explicitly understand how the system exploits the underlying parallel-processing hardware. To accomplish this project, researchers studied the actual application needs of typical users — to assure that the results would be widely applicable and useful.

Quick to Market

Torrent produced a research prototype of a parallel-software component framework, created its basic components, and performed limited testing on them. It also planned to develop a library of reusable code — containing components for a parallel-processing system. If such a library were available for other developers, then even more applications could come on line sooner. The company, however, did not complete this research task. Torrent closed the project before its anticipated completion date in order to commercialize early technical results and generate needed revenue.



A graphic illustration of a 16 processor system under the control of Orchestrate --- three sources of input data (shown at the top of the screen in green) are split into many parallel data streams, each to be manipulated by a sequence of software components (the grids at the bottom in red) which apply the same logic to each stream.

Torrent incorporated the ATP-funded component-based technology in a product called Orchestrate™, which the company describes as a "parallel application environment that insulates you from the complexities of parallel programming while delivering scalable applications." United Airlines and Citicorp were two of the first corporations to license it.

PROJECT HIGHLIGHTS

Project:
To develop component-based tools for writers of parallel-processing software, as well as a library of reusable parallel-processing software components.

Duration: 12/1/1994 to 7/31/1996
ATP Number: 94-06-0024

Funding (in thousands):

ATP	$1,117	77%
Company	325	23%
Total	$1,442	

Accomplishments:
Torrent accomplished most of the project goals, including development of a software environment for building parallel data-processing applications. The company did not develop as extensive a library of reusable components as originally anticipated. It halted the project sooner than originally planned to exploit the excellent commercial opportunities for technology developed early in the project. Torrent's outstanding progress toward commercialization is indicated by the following:

- The company applied for a patent on parallel training of neural networks, as well as patents on several other innovations.

- Torrent incorporated the ATP-funded technology in a product called Orchestrate™, introduced to the market in 1996. The company describes it as "a parallel development environment that insulates you from the complexities of parallel programming while delivering scalable applications."

- Orchestrate™ was described in a December 1996 Datamation article, "Build Your Warehouse on MPP," as one of a number of approaches to use in data warehousing.

- Orchestrate™ was selected in 1997 for use by KO1, IBM, Citicorp, Autozone, Sears Roebuck, and United Airlines.

- Torrent entered into a strategic partnership in July 1997 with IBM, which will promote Orchestrate™ as a standard computer application. IBM is focusing on rapid development and deployment of a parallel-processing software system that can be enlarged without needing to be replaced by a new version, because expansion of the system is built into its architecture. Orchestrate™ plays a key role in the expansion capability of the IBM system. Torrent extended the partnership in September 1997, with IBM agreeing to resell Orchestrate™.

- Torrent entered into partnerships in September 1997 with three new vendors: The MEDSTAT Group, i.d.Centric, and Knowledge Discovery One.

- The company also negotiated bundling arrangements (selling two or more separately produced products as a unit) with independent software vendors and manufacturers including Emergent, Knowledge Discovery One, Lockheed Martin IS&T, and MRJ Technology Solutions.

- During 1997, several commercial software vendors chose Orchestrate™ for building their software products. The first such product, produced by the SAS Institute, reached the market in late 1997.

- At the end of 1997, Computerworld magazine recognized Torrent as one of the "100 Hot Emerging Companies."

- Torrent had attracted investments of $3.8 million by the end of the ATP project in July 1996, and it increased the total to $10 million over the next 18 months.

- United Airlines, an early customer, is using Orchestrate™ and an IBM parallel-processing computer to design a system for managing airplane seat assignments. United expects the new system to generate between $50 million and $100 million per year in increased revenue. The company is spending only about $17 million on the system, which would not work without Orchestrate™.

Commercialization Status:
The ATP-funded programmer's tool for writing parallel processing software has been commercialized. It is embodied in Orchestrate™, as well as in derivative products.

Outlook:
The outlook for further commercialization and economic benefits is excellent. The strong market interest in Orchestrate™ indicates its usefulness in processing immense amounts of data. Since government and many industries — retail, health care, energy, and transportation — use massive databases, new tools that can dramatically increase processing efficiency stand to yield billions of dollars in savings across the economy. The benefits from this project will accrue mostly to users of the technology, rather than to Torrent.

Number of employees: 2 at project start, 32 at the end of 1997
Composite Performance Score: * * * *

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Strategic Marketing Alliances

The company has been quick to form strategic marketing alliances. It formed a partnership with IBM in July 1997, under which IBM will promote Orchestrate™ as a standard computer application. IBM's focus is rapid development and deployment of a parallel-processing hardware/software system that can be enlarged without needing to be replaced by a new version, because expansion is built into its architecture. Orchestrate™ plays a key role in that expansion capability. The IBM system is specifically designed to make full use of customer sales and other data across an entire company, regardless of the type of business. Torrent extended that partnership a few months later, with IBM agreeing to resell Orchestrate™.

. . . halted the project sooner than originally planned to exploit the excellent commercial opportunities for technology developed early in the project.

United Airlines, an early customer, reported in a November 1997 Chicago Tribune article that it had installed a new IBM RS6000/SP2 parallel-processing computer. The software supplied by IBM included Orchestrate™ under a licensing agreement between Torrent and IBM. United paid $3.5 million for the hardware and planned to spend another $13.5 million to get the computer running. The system is expected to generate between $50 million and $100 million per year in increased revenue by doing a better job of matching potential fliers with available airplane seats. Orchestrate™ is a critical component that enables

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United personnel to program the computer, which United would not otherwise have bought. This advance is important, since the RS6000/SP2 has been on the market for several years.

Torrent also formed a marketing partnership with Sun Microsystems in 1997. An early outgrowth of this alliance was a joint demonstration showing the advantages of using Orchestrate™ in a typical data warehousing application. Orchestrate™ was used to integrate the basic Torrent components and specialized components

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from threeother vendors into a single test application. The test involved data cleaning of a name-and-address file of about 13 million records, which was then merged with a demographics file of about 16 million records. When the test was run without using parallel processing, the application took 32.5 hours on a machine using four processors. With Orchestrate™, the application took only 9 hours. When the number of processors was increased to 12, the Orchestrate™-based application finished in just 3 hours.

Torrent also entered partnerships in September 1997 with three new software vendors: The MEDSTAT Group, i.d.Centric, and Knowledge Discovery One. And it negotiated bundling arrangements (selling two or more separately produced products as a unit) with independent soft-ware vendors and manufacturers, including Emergent, Knowledge Discovery One, Lockheed Martin IS&T, and MRJ Technology Solutions.

Potential for Huge Benefits

Torrent has succeeded in marketing its technology, and substantial broad-based benefits can be expected to flow from the use of the new technology incorporated in its software. Users of Orchestrate™ have benefited from the removal of the need to pay attention to programming details for C/C++ (the most common language used to write programs for parallel processing), because Orchestrate™ handles them. As more applications of the new technology are implemented through the use of Orchestrate™ and other Torrent products, more analyses of large databases will be done. Another product that uses the ATP-funded technology is Orchestrator for the SAS System™, recently released by the SAS Institute.

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Economic benefits are likely to be large and widespread for this technology. It is embodied in industrial strength computer programs used in diverse industries and by government agencies. Users in these areas say they anticipate dramatic savings. Consumers will also benefit from these savings, as lower operating costs are passed on to them. Torrent, a small company, will be able to collect only a small percentage of the total additional value created by its technology, while the rest will spill over to others in the economy.

The benefits from the ATP project would likely be even greater if Torrent had been able to fully develop and make available the library of reusable components as originally planned. However, as is often the case with small, near-startup companies, cash-flow concerns related to ensuring company survival dictated a fast move to generate revenue. In this case, given its limited resources, Torrent felt it had to stop the research project early and commercialize the technology. As customers suggest needs for other components, they will be developed and integrated into the company's products.

ATP Project Speeds Exploitation of Parallel Processing

ATP funding for this project allowed Torrent to research and develop a prototype of a component software system that allows programmers to create parallel-processing software in a user-friendly way. Without the ATP funds, Torrent officials say, it is doubtful that the

technology could have been successfully developed at all. Venture capital funding had been sought but was unavailable. ATP funded the project to enable U.S.

Venture capital funding had been sought but was unavailable. ATP funded the project to enable U.S. industry to broadly and rapidly exploit parallel processing.

industry to broadly and rapidly exploit parallel processing, expecting that it would generate significant benefits throughout the economy. The speedy adoption of Torrent's first commercial products confirms that expectation.